



DEPARTMENT OF MATHEMATICS

UNIT-III-SOLUTIONS OF EQUATIONS

$$x_4 = 0.9170$$

$$y_4 = 1.6475$$

$$z_4 = 1.1953$$

$$x_5 = 0.9174$$

$$y_5 = 1.6473$$

$$z_5 = 1.1954$$

$$x_6 = 0.9174$$

$$y_6 = 1.6473$$

$$z_6 = 1.1954$$

$$\therefore x = 0.9174, y = 1.6473, z = 1.1954$$

Gauss - Jacobi Method

Let the system of simultaneous equations be

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

Assume, $|a_1| > |b_1| + |c_1|$

$$|b_2| > |a_2| + |c_2|$$

$$|c_3| > |a_3| + |b_3|$$

i.e. The diagonal elements should be dominant, so that the

iteration process can

This system of equations can also be written as

$$x = \frac{1}{a_1} (d_1 - b_1y - c_1z)$$

$$y = \frac{1}{b_2} (d_2 - a_2x - c_2z)$$

$$z = \frac{1}{c_3} (d_3 - a_3x - b_3y)$$



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Solve the following system by Gauss Jacobi method

$$10x - 5y - 2z = 3$$

$$4x - 10y + 3z = -3$$

$$x + 6y + 10z = -3$$

Soln: $\therefore |10| > |1 \cdot 5| + |1 \cdot 2|$

$$|-10| > |4| + |3|$$

$$|10| > |1| + |6|$$

Since the diagonal elements are dominant, the iteration process can be applied.

The given system can be written as,

$$x = \frac{1}{10} (3 + 5y + 2z)$$

$$y = \frac{1}{-10} (3 + 4x + 3z)$$

$$z = \frac{1}{10} (-3 - x - 6y)$$

$$x = \frac{1}{10} (3 + 5y + 2z)$$

$$y = \frac{-1}{10} (3 + 4x + 3z)$$

$$z = \frac{1}{10} (-3 - x - 6y)$$

$$x_1 = 0.3$$

$$y_1 = 0.3$$

$$z_1 = -0.3$$

$$x_2 = 0.39$$

$$y_2 = 0.33$$

$$z_2 = -0.51$$

$$x_3 = 0.363$$

$$y_3 = 0.303$$

$$z_3 = -0.537$$

$$x_4 = 0.3441$$

$$y_4 = 0.2841$$

$$z_4 = -0.5181$$

$$x_5 = 0.3384$$

$$y_5 = 0.2822$$

$$z_5 = -0.5048$$

$$x_6 = 0.3401$$

$$y_6 = 0.2829$$

$$z_6 = -0.5031$$

$$x_7 = 0.3413$$

$$y_7 = 0.2751$$

$$z_7 = -0.5043$$

$$x_8 = 0.3416$$

$$y_8 = 0.2852$$

$$z_8 = -0.5051$$

$$x_9 = 0.3415$$

$$y_9 = 0.28511$$

$$z_9 = -0.5052$$

$$x_{10} = 0.34148$$

$$y_{10} = 0.28504$$

$$z_{10} = -0.5052$$

$$x \approx 0.3415, y \approx 0.2850, z \approx -0.5052$$



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Q) Solve the following using Gauss Jacobi's

Iteration method: $30x - 2y + 3z = 75$

$$x + 17y - 2z = 48$$

$$x + y + 9z = 15$$

Sol: $a_1: |30| > |-2| + |3|$

$$b_2: |17| > |1| + |-2|$$

$$c_3: |9| > |1| + |1|$$

Since the diagonal elements are dominant. The iteration process is applied here:

The given system can be written as:

$$x = \frac{1}{30} [75 + 2y - 3z]$$

$$y = \frac{1}{17} [48 - x + 2z]$$

$$z = \frac{1}{9} [15 - x - y]$$

$x = \frac{1}{30} [75 + 2y - 3z]$	$y = \frac{1}{17} [48 - x + 2z]$	$z = \frac{1}{9} [15 - x - y]$
$x_1 = 2.5$	$y_1 = 2.8235$	$z_1 = 1.6667$
$x_2 = 2.5217$	$y_2 = 2.8725$	$z_2 = 1.0751$
$x_3 = 2.5839$	$y_3 = 2.8016$	$z_3 = 1.0673$
$x_4 = 2.5800$	$y_4 = 2.7971$	$z_4 = 1.0682$
$x_5 = 2.5796$	$y_5 = 2.7974$	$z_5 = 1.0692$
$x_6 = 2.5795$	$y_6 = 2.7975$	$z_6 = 1.0692$
$x_7 = 2.5795$	$y_7 = 2.7975$	$z_7 = 1.0692$

$\therefore x = 2.5795, y = 2.7975, z = 1.0692$